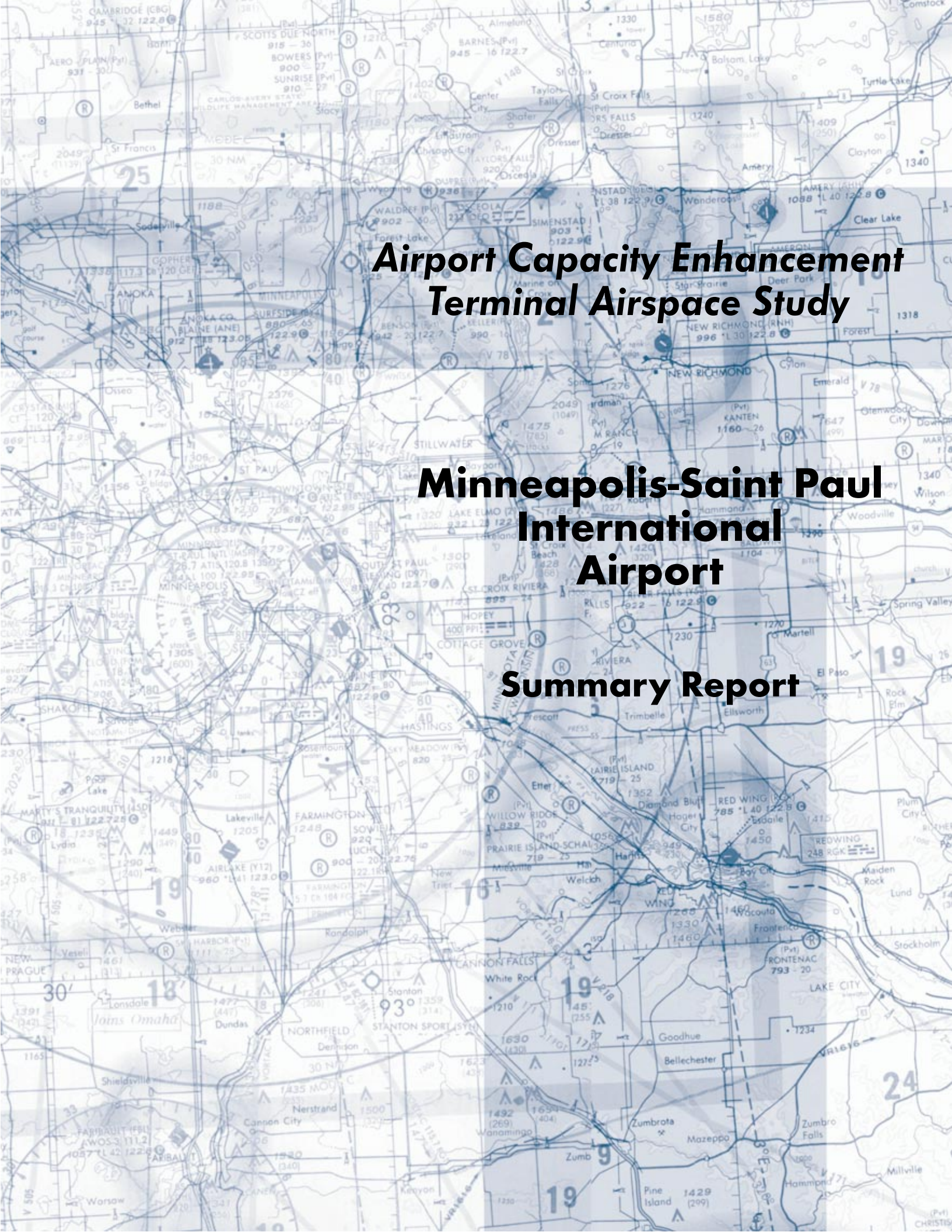

Airport Capacity Enhancement Terminal Airspace Study

Minneapolis-Saint Paul International Airport

Summary Report

Airport Capacity Enhancement

Terminal Airspace Study

Minneapolis-Saint Paul International Airport

Summary Report

August 1996

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Purpose of the Study

The 1996 Minnesota Legislature directed the Metropolitan Airports Commission (MAC) to implement the 2010 Long Term Comprehensive Plan for the Minneapolis-Saint Paul International Airport (MSP). The comprehensive plan includes the addition of another runway — the north-south runway — to the airport. The Federal Aviation Administration (FAA) has completed a 21-month study of how the airspace around the airport would accommodate the addition of that new runway at MSP. This document summarizes that study.

A Summary of Results

In summary, the FAA MSP airspace study found that:

- The existing airspace can be reconfigured to accommodate a new north-south runway.
- By adding either a new jet arrival fix or new parallel jet arrival stream the airspace can be made more efficient, which could decrease the average delay by one-tenth to seven-tenths of a minute per aircraft.
- Of the two alternative airspace configurations studied, the New Arrival Fix alternative performs the best, providing the least delay.
- None of the satellite airports are expected to be adversely impacted by changing the existing airspace to accommodate a new north-south runway.
- Aircraft flying between satellite airports which currently fly over the top of MSP would no longer be able to take that direct route with the north-south runway in place.
- The changed airspace would mean that about 40 to 50 general aviation aircraft a day would be required to fly in a 15-mile arc around MSP adding 25 to 30 miles of flying distance for each operation.
- Another 100 general aviation aircraft per day would have an added 10 miles of flying because of the descent area necessary for the north-south runway.
- The addition of the runway would result in a change in the Class B or protected airspace, likely increasing its total radius from 20 to 30 nautical miles and increasing its ceiling from 8,000 feet to 10,000 feet.

Next Steps

Any changes made in the MSP airspace to accommodate the north-south runway will be subject to environmental review and will be studied as a part of the Dual Track environmental review process. Under the MSP Long Term Comprehensive Plan, the new north-south runway would be constructed in the 2002-2005 time period, which would provide ample time for the EIS and approval of airspace configuration changes.

Summary Report

Background

In 1993, the Federal Aviation Administration (FAA) completed a study of airfield capacity at the Minneapolis-Saint Paul International Airport (MSP), one of more than 30 capacity studies conducted by the FAA at major airports around the U.S. The study was initiated at the request of the Metropolitan Airports Commission (MAC).

The study was conducted by an FAA Capacity Design Team and used a computer model to evaluate the benefits achieved by adding runway capacity at MSP. The computer model enabled the Capacity Design Team to look at the comparative benefits of various runway alternatives. The result of that study was the Minneapolis-Saint Paul International Airport Capacity Enhancement Plan, released in December 1993.

The FAA began a second phase of its capacity analysis in October 1994, this time examining the airspace capacity around MSP. At about the same time, the Minnesota Department of Transportation (MnDOT) completed a study of the airspace changes that would be necessary if a new replacement airport were built in Dakota County.

The FAA's MSP airspace study was conducted by an FAA Capacity Design Team composed of representatives from the FAA, the Metropolitan Airports Commission, Northwest Airlines and the MnDOT. The Design Team spent 21 months evaluating the impacts on airspace capacity of the proposed airfield improvements in the MSP Long Term Comprehensive Plan. The results of that airspace study are summarized in this document and contained in a companion technical report.

Related Dual Track Airport Studies

Separate studies completed by the MAC and the Metropolitan Council in the late 1980s concluded that additional airport capacity would be needed to meet future demand at Minnesota's largest airport.

As a result, the 1989 Minnesota Legislature called for a seven-year study by the MAC and the Metropolitan Council of how to best meet future aviation demand. The study was called the Dual Track Airport Planning Process. It directed the agencies to determine whether future needs could best be met by expanding MSP or building a new replacement airport.

As part of that study, the MAC completed a long term comprehensive plan for future expansion of the Minneapolis-Saint Paul International Airport. The long term comprehensive plan for MSP included the addition of a north-south runway, Runway 17/35, to meet future airfield demand (diagram on page A-13). The MAC also completed a comprehensive plan for a new airport at a site in Dakota County.

The Dual Track Airport Planning Process concluded in 1996. After comparing the data that had been gathered, the MAC and Metropolitan Council recommended to the Minnesota Legislature that future aviation demand should be met by expanding the Minneapolis-Saint Paul International Airport.

The 1996 Legislature acted on the recommendation of the MAC and the Metropolitan Council. The Legislature directed the MAC to implement its 2010 Long Term Comprehensive Plan for MSP, including the new north-south runway. At the same time, the Legislature prohibited acquisition of land for a new major airport and prohibited the addition of a third parallel runway to the airport without the approval of the affected cities.

A Description of the MSP Airspace Study

During the course of the FAA's MSP airspace study, the Capacity Design Team did the following:

- Examined whether or not the existing airspace could be modified to accommodate the north-south runway;
- Since a higher level of operations will occur with the north-south runway, the team evaluated what benefits could be achieved if additional changes were made to the airspace (i.e. adding an additional aircraft arrival stream or arrival fix);
- Examined what impacts changing the existing airspace to accommodate a north-south runway would have on the system of 13 satellite airports around the Twin Cities metropolitan area.

The study used a computer model developed by the FAA, the Airport and Airspace Simulation Model (SIMMOD). The computer model helped to quantify the efficiency of various airspace configurations and predict impacts on the satellite airports.

The airspace configurations were examined under a variety of different runway usages for arrivals and departures, and under weather conditions that included both Visual Flight Rules and Instrument Flight Rules.

The airspace configurations were evaluated under two different future benchmark levels of activity that were chosen to represent future growth in annual aircraft operations in the earlier FAA airfield capacity study. They were:

- Future 1 — 530,000 operations
- Future 2 — 600,000 operations

The simulation model considered air traffic control procedures, airfield improvements and traffic demands. Air traffic demand levels were derived from *Official Airline Guide* data, historical data and Capacity Team and other forecasts. Aircraft volume, mix, and peaking characteristics were considered for each of the different forecast levels.

Existing Airspace Changes to Accommodate the North-South Runway

The study found that changes could be made in the existing airspace to accommodate the addition of the north-south runway. The types of changes that will be necessary will involve adding airspace pathways for arrivals to and departures from the north-south runway, within the area controlled by Minneapolis-Saint Paul Air Traffic Control.

Aircraft arriving on a runway are provided dedicated airspace from a 25-mile point from the airport, on a direct line to the landing runway. Those aircraft will be descending from altitudes of 10,000 feet to landing. Departing aircraft are provided airspace from the end of the runway to 10 miles out as they climb.

These changes in the existing airspace will have some impacts on general aviation aircraft and on the Class B airspace.

Impact on the Satellite Airports

There are 13 airports classified as satellite airports in all directions in the vicinity of the Minneapolis-Saint Paul International Airport. Six of them are part of the MAC reliever airport system. A satellite airport is defined for purposes of this report as an airport that takes pilot training activity away from MSP and/or provides service for corporate and other general aviation aircraft.

The FAA's Minneapolis Approach Control reviewed possible airspace changes required with the addition of the north-south runway and concluded that none of the satellite airports are expected to be adversely impacted by the changed airspace.

The satellite airports will be able to retain all of their current instrument approaches and should therefore not see any reduction in their usability. The path and distances required to reach these airports will change in certain instances.

Due to the location of these airports, aircraft often need to travel from an airport on one side of MSP to one on the other side of MSP. In this situation, most of these aircraft fly directly over the top of the Minneapolis-Saint Paul airport at altitudes of 3,500 feet to 6,000 feet.

There are approximately 40 to 50 aircraft a day that utilize this route. With the addition of the north-south runway, this corridor becomes unavailable. The aircraft would need to fly in a 15-mile arc around MSP. This would result in an added 25 to 30 miles of flying distance for each operation.

An additional 100 general aviation aircraft per day would have to fly about an extra 10 miles because they would no longer be able to use airspace that would be designated as the descent area for aircraft landing from the south on the north-south runway.

Probable Need to Modify Class B Airspace

Class B airspace is the airspace previously called the Terminal Control Area. Its purpose is to ensure that aircraft operating to and from the busiest airports in the country are segregated from other aircraft not under air traffic control jurisdiction. The Class B airspace is often described as an upside down wedding cake overlying the airport. (See diagram on page A-14)

The radius of the airspace is 20 nautical miles. At 20 nautical miles, the floor of the Class B airspace is 4,000 feet with a ceiling of 8,000 feet, meaning aircraft not going to MSP and flying in good weather can fly under the floor of the airspace without the need for air traffic control. The floor of the Class B airspace gets progressively lower as it gets closer to MSP, and ultimately extends to the ground at a radius of six nautical miles.

It will probably be necessary to make the Class B airspace larger in order to handle the increased volume of air traffic that will occur with the addition of the north-south runway. A likely expansion would be from a 20-nautical mile radius to a 30-nautical mile radius, and from a ceiling of 8,000 feet to 10,000 feet, which is consistent with the Class B airspace for most other major airports.

The practical effect of this change is that many of the aircraft that are using the satellite airports and do not wish to receive air traffic control clearance into the Class B airspace would have to fly slightly longer or more circuitous routes, or fly at a lower altitude.

Alternative Configurations

The Capacity Design Team examined what benefits could be achieved if in addition to accommodating the north-south runway in the existing airspace, another jet arrival fix or an additional parallel jet arrival stream was added. The three alternatives that were examined under varying levels of aircraft operations, weather conditions and runway usages were:

- **Existing** — The current airspace with the addition of the north-south runway. (See diagram on page A-14)
- **Alternative 1: New Arrival Fix** — The current airspace with the addition of the north-south runway, and a new jet arrival stream fix southeast of the airport. (See diagram on page A-15)
- **Alternative 2: Parallel Arrival Stream** — The current airspace with the addition of the north-south runway and an additional jet arrival stream at an existing fix east of the airport. (See diagram on page A-15)

The three different airspace configurations were evaluated by computer simulation for the level of delay experienced with each. For purposes of this study, delay is defined as the total time above the aircraft's unimpeded travel time from entry into the Terminal Control Area to landing on the runway.

Below are the results of the computer delay analysis. Under both Future 1 and Future 2 levels of aircraft operations, the New Arrival Fix alternative performs better than the others.

Airspace Capacity Comparison

	Average Daily Delay Comparison	
	Future 1	Future 2
Alternatives With N/S Runway	Minutes per Aircraft	Minutes per Aircraft
Existing Airspace	2.8 minutes	4.8 minutes
New Arrival Fix	2.6 minutes	4.1 minutes
Parallel Arrival Stream	2.7 minutes	4.5 minutes

A Summary of Conclusions

In summary, the FAA MSP airspace study found that:

- The existing airspace can be reconfigured to accommodate a new north-south runway.
- By adding either a new jet arrival fix or new parallel jet arrival stream the airspace can be made more efficient, which could decrease the average delay by one-tenth to seven-tenths of a minute per aircraft.
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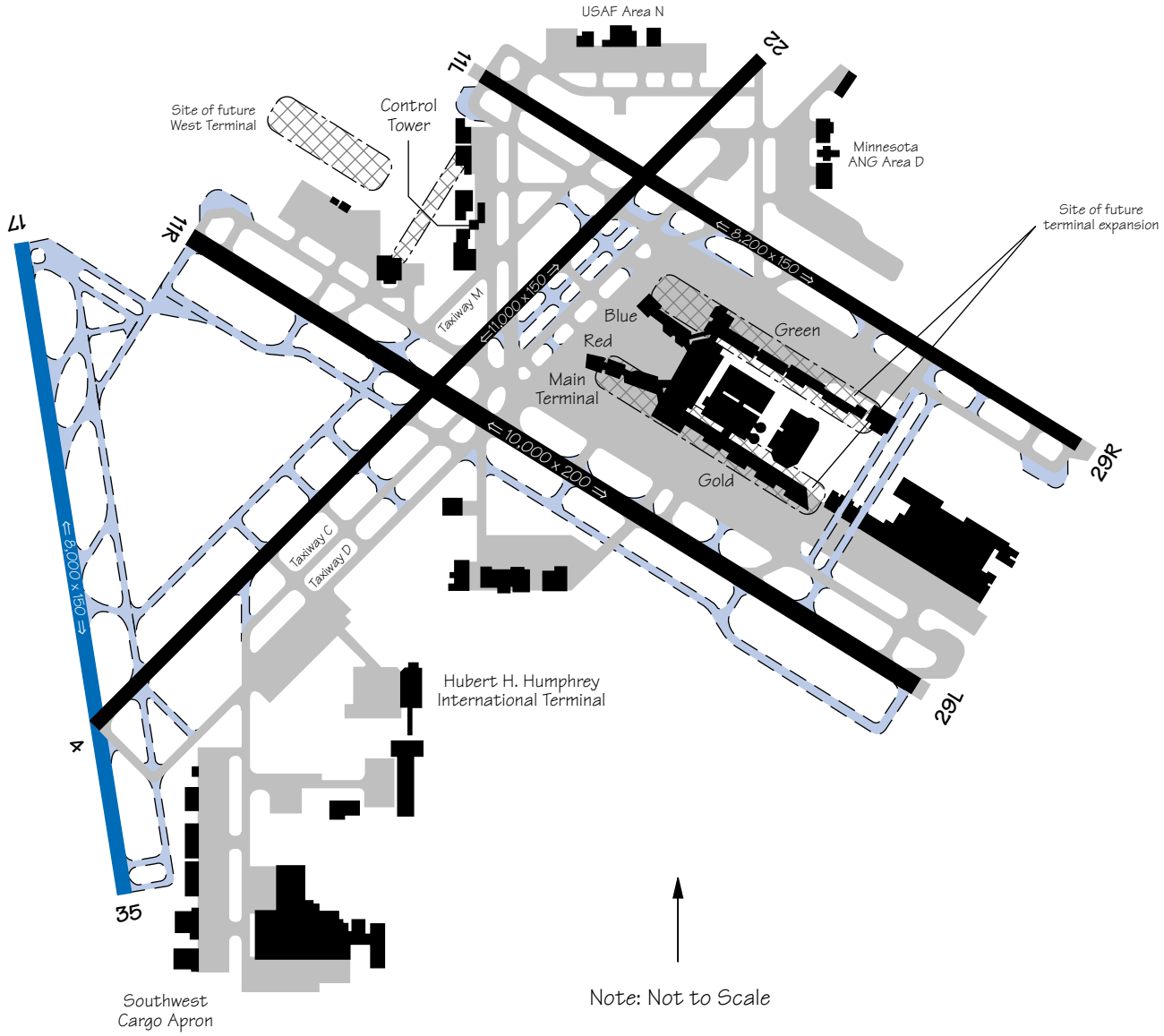
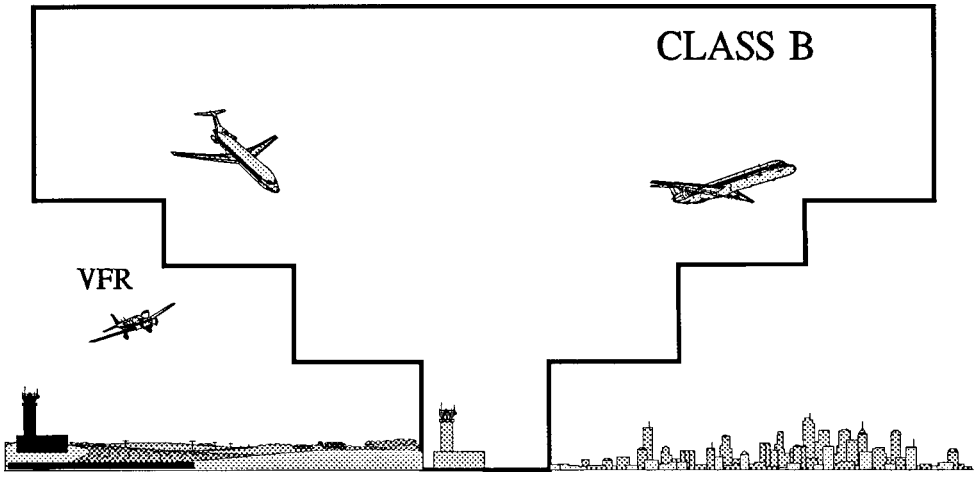
APPENDIX A

DIAGRAMS

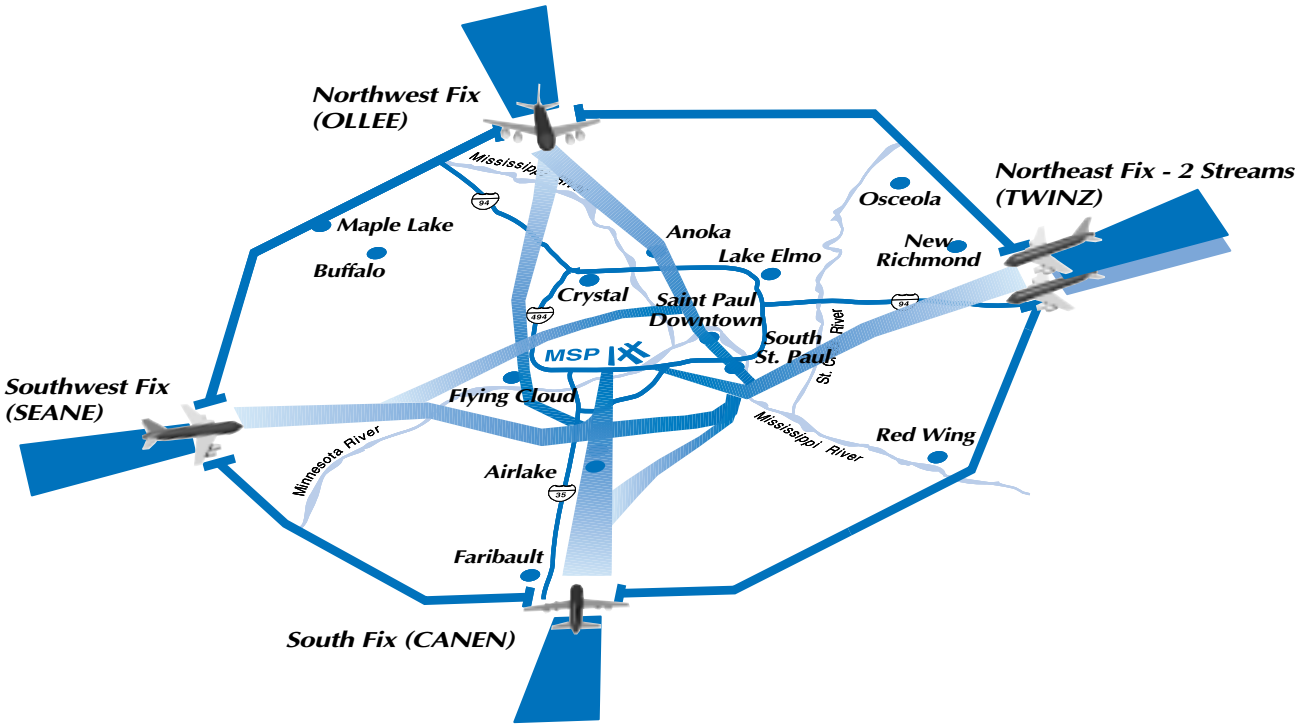
Minneapolis/Saint Paul International Airport



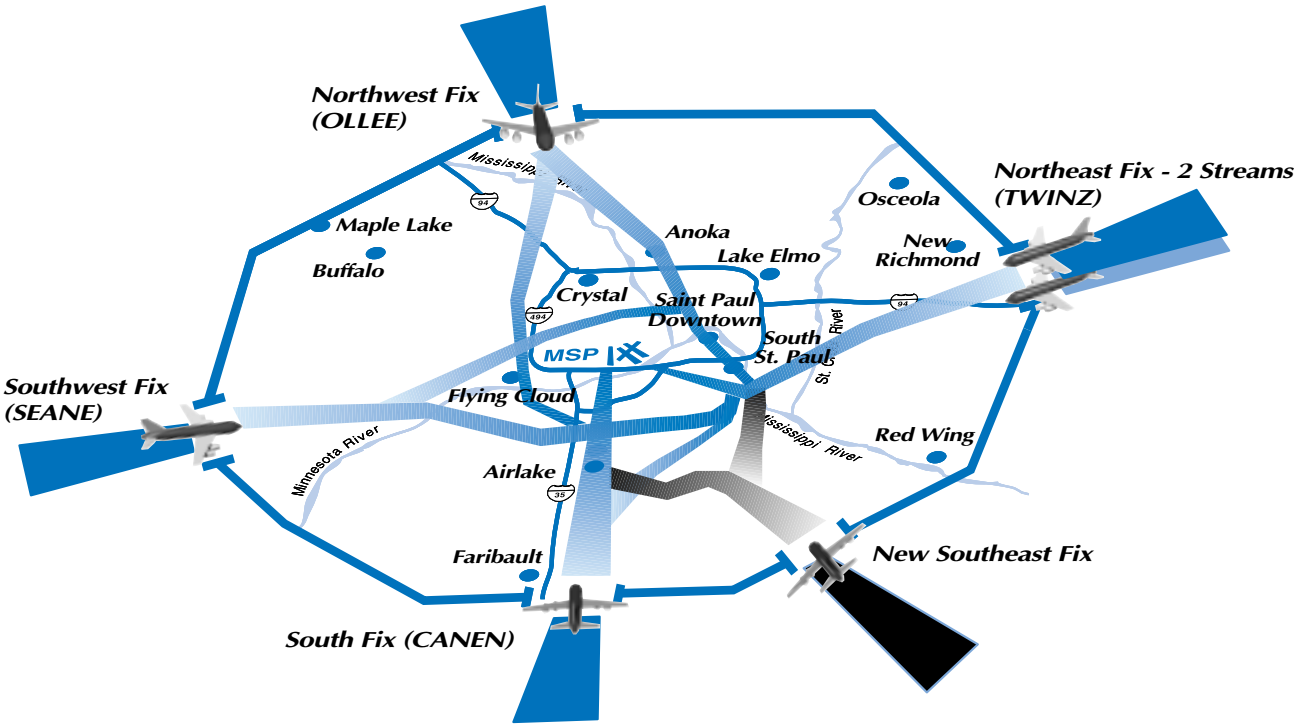
Class B Airspace



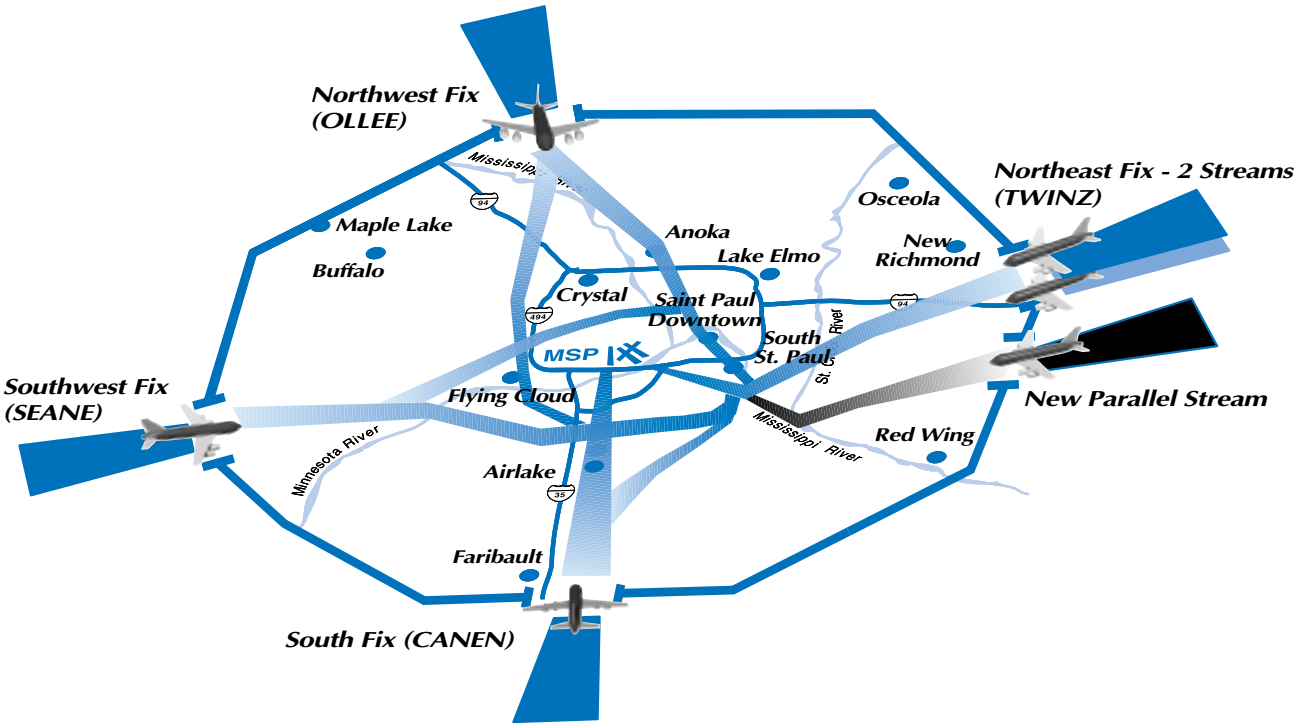
MSP TRACON Arrival Fixes (Runway 17/35)



MSP TRACON Arrival Fixes (Runway 17/35 — Alternative 1)



MSP TRACON Arrival Fixes (Runway 17/35 — Alternative 2)



APPENDIX B

GLOSSARY

Approach Control ..... A terminal air traffic control facility that provides approach control service (radar) in a terminal area.

Arrival Fix ..... The point at which an aircraft enters the terminal airspace to land at an airport. At MSP, this point is 35 miles away from the airport.

Arrival Stream ..... A dedicated route that an arriving aircraft follows from its entry into the terminal airspace at the arrival fix to its destination airport.

Capacity Design Team ..... An FAA team composed of representatives from the FAA, airline industry and airport operators that worked on FAA capacity studies around the country.

Class B Airspace ..... The airspace from the surface to 8,000 feet mean sea level surrounding MSP. The airspace consists of three layers which resemble an upside down wedding cake. An air traffic control clearance is required for all aircraft to operate in this area and all aircraft that are cleared receive separation services within the airspace (See diagram on page A-14).

Delay ..... The delay represented in the table on page 10 as calculated for each of the configurations is the total time above unimpeded travel time from when an aircraft enters the Terminal Airspace to when it lands on the runway.

Instrument Flight Rules (IFR) ..... Weather conditions with poor visibility or low ceiling that force pilots to navigate using their cockpit instruments. The minimums are visibility of three nautical miles and/or a ceiling of 1,000 feet above ground level.

Minneapolis-Saint Paul International Capacity Enhancement Plan .. A plan completed by the FAA in December 1993 which identified and evaluated alternative means to enhance existing airfield capacity to handle future demand, decrease delays and improve airport efficiency.

Minneapolis-Saint Paul International Long Term Comprehensive Plan .. A future development plan for MSP completed by the Metropolitan Airports Commission.

Satellite Airports ..... For purposes of this report, satellite airports are defined as airports that take pilot training activity away from MSP and/or provide service for corporate and other general aviation aircraft. There are 13 in the vicinity of MSP that are referred to in the report. They include six airports owned by MAC: Flying Cloud, Airlake, St. Paul Downtown, Crystal, Lake Elmo and Anoka. The other seven satellite airports are at Faribault, Redwing, South St. Paul, Maple Lake, Buffalo and in Wisconsin at Osceola and New Richmond.

SIMMOD ..... SIMMOD is the Airport and Airspace Simulation Model, a sophisticated computer model developed by the FAA to analyze potential airport improvements in relation to current and future demands.

Terminal Airspace ..... A general term used to describe airspace in which approach control is provided.

Visual Flight Rules (VFR) ..... Weather conditions with visibility good enough to allow pilots to navigate visually rather than using cockpit instruments.

APPENDIX C

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